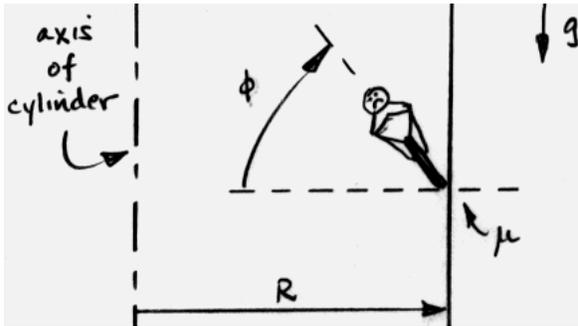


**PROBLEM SET 7**

1. A trick cyclist rides his bike around a “wall of death” in the form of a vertical cylinder (see figure). The maximum frictional force parallel to the surface of the cylinder is equal to a fraction  $\mu$  of the normal force exerted on the bike by the wall. Assume that the cyclist and his bike are small relative to the radius of the cylinder.



- (a.) At what minimum speed must the cyclist go to avoid slipping down?
- (b.) At what angle  $\phi$  to the horizontal must he be inclined at that minimum speed?
- (c.) If  $\mu=0.6$  (typical of rubber tires on dry roads) and the radius of the cylinder is 5 m, at what minimum speed must the cyclist ride, and what angle does he make with the horizontal?

2. K&K problem 6.24 “Drum  $A$  of mass  $M$  and radius  $R$ ...”.

3. K&K problem 6.27 “A yo-yo of mass  $M$  has an axle...”.

4. Two men, each of mass 100 kg, stand at opposite ends of the diameter of a rotating turntable of mass 200 kg and radius 3 m. Initially the turntable makes one revolution every 2 sec. The two men make their way to the middle of the turntable at equal rates.

- (a.) Calculate the final rate of revolution and the factor by which the kinetic energy of rotation has been increased.
- (b.) Analyze, at least qualitatively, the means by which the increase of rotational kinetic

energy occurs.

- (c.) At what radial distance from the axis of rotation do the men experience the greatest centrifugal force as they make their way to the center?

5. K&K problem 7.4 “In an old-fashioned rolling mill, grain...”.

6. K&K problem 7.5 “When an automobile rounds a curve...”.

7. K&K problem 8.2 “A truck...”.

8. K&K problem 8.4 “The center of mass...”.